

Usefulness of self-report questionnaires for psychological assessment of patients with tinnitus and hyperacusis and patients' views of the questionnaires

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Short title

Acceptability of psychological questionnaires for tinnitus/hyperacusis patients

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20 Abbreviations

| | | |
|----|-------|--|
| 21 | CBT | Cognitive behavioural therapy |
| 22 | CI | Confidence Interval |
| 23 | ENT | Ear, nose, and throat |
| 24 | GAD | Generalised Anxiety Disorders questionnaire |
| 25 | GP | General Practitioner |
| 26 | HADS | Hospital Anxiety and Depression Scale |
| 27 | HAI | Health Anxiety Inventory |
| 28 | HQ | Hyperacusis questionnaire |
| 29 | IAPT | Improving Access to Psychological Therapies |
| 30 | ISI | Insomnia severity index |
| 31 | NHS | National Health Service |
| 32 | OCI | Obsessive Compulsive Inventory |
| 33 | PDSS | Panic Disorder Severity Scale |
| 34 | PFQ | Patient Feedback Questionnaire |
| 35 | PHQ | Patient Health Questionnaire |
| 36 | PSWQ | Penn State Worry Questionnaire |
| 37 | PTA | Pure tone average |
| 38 | RRR | Relative risk ratio |
| 39 | SD | Standard deviation |
| 40 | SHAI | Short Health Anxiety Inventory |
| 41 | SPIN | Social Phobia Inventory |
| 42 | THI | Tinnitus Handicap Inventory |
| 43 | THTSC | Tinnitus and Hyperacusis Therapy Specialist Clinic |
| 44 | ULL | Uncomfortable Loudness Level |
| 45 | VAS | Visual Analogue Scale |

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Objective: The objective was to determine the relevance and applicability of psychological questionnaires to patients seeking help for tinnitus and/or hyperacusis. *Design:* This was a questionnaire-based survey. The following questionnaires were administered: Generalized Anxiety Disorder (GAD-7), Short Health Anxiety Inventory (SHAI), Mini-Social Phobia Inventory (Mini-SPIN), Obsessive Compulsive Inventory-Revised (OCI-R), Panic Disorder Severity Scale-Self Report (PDSS-SR), Patient Health Questionnaire (PHQ-9), and Penn State Worry Questionnaire-Abbreviated version (PSWQ-A). In addition, a patient feedback questionnaire was completed asking about the extent to which each questionnaire was relevant to them and how strongly they would recommend its use in the assessment of patients with tinnitus and hyperacusis. *Study Sample:* A total of 150/402 consecutive patients seen in a one-year period completed the questionnaires. *Results:* 65% of patients had abnormal scores for one or more of the questionnaires. All questionnaires except the PDSS-SR were rated as relevant and recommended for use. *Conclusions:* The GAD-7, SHAI, Mini-SPIN, OCI-R, PSWQ-A, and PHQ-9 are recommended for evaluation of psychological problems for patients seeking help for tinnitus and/or hyperacusis. Abnormal results on these questionnaires may indicate the need for referral for possible treatment of psychological problems.

Key Words: Tinnitus; Hyperacusis; Psychological assessment; Mental health; Patients' views

Tinnitus is the sensation of sound without any external sound source. Hyperacusis is intolerance of everyday sounds that causes significant distress and impairment in social, occupational, recreational, and other day-to-day activities (Aazh et al, 2016). The sounds may be perceived as uncomfortably loud, unpleasant, frightening, or painful (Tyler et al, 2014).

There are several reports suggesting a high prevalence of psychological disturbances in patients suffering from tinnitus and hyperacusis (Pinto et al, 2014; Juris et al, 2013; Schecklmann et al, 2014; Andersson et al, 2004; Pattyn et al, 2016; Paulin et al, 2016; Aazh et al, 2016; Aazh & Allott, 2016). The prevalence of psychological disorders in the tinnitus population is estimated to be between 10% (Bartels et al, 2008) and 69% (Andersson et al, 2004) for depression, 40% for panic disorder (Mathias et al, 2011), between 10% (Bartels et al, 2008) and 23% (Adoga et al, 2008) for anxiety, 83% for obsessive compulsive disorder (OCD) (Andersson et al, 2004), and 63% for social phobia (Andersson et al, 2004). For patients whose main complaint is hyperacusis, prevalence percentages are 47% for anxiety disorder (Juris et al, 2013) and 52% for OCD (Juris et al, 2013). Schroder et al (2013) reported that 52% of patients with hyperacusis were diagnosed with obsessive compulsive personality disorder. Schecklmann et al (2014) reported that 20% of patients with hyperacusis combined with tinnitus were receiving psychiatric care. Paulin et al (2016) reported that among 30 patients with self-reported hyperacusis, 5% had generalised anxiety disorder, 17% had depression and 3.5% had panic disorder.

There is no recent report about the extent to which tinnitus and hyperacusis patients seen in UK National Health Service (NHS) audiology outpatient services suffer from psychological disturbances. McKenna et al (1991) reported that 45% of 44 consecutive patients with tinnitus seen in a neuro-otology NHS outpatient clinic were in need of psychological help. However, their study was conducted at a center that receives secondary and tertiary referrals. The prevalence of psychological disorders may have been higher in their population than in typical audiology outpatient clinics.

Audiology departments play a major role in offering therapy and support for patients experiencing tinnitus and hyperacusis (Thompson et al, 2016). In the UK, 82% of tinnitus patients follow a referral path to Audiology for management and therapy either via their

General Practitioners (GPs) or via Ear-Nose-Throat (ENT) departments (Gander et al, 2011). In tinnitus and hyperacusis clinics, it is important to screen for psychological co-morbidities in order to make appropriate onward referrals to mental health services when needed (Department of Health, 2009; McKenna et al, 1991). In the UK mental health services, the initial treatment for people suffering from anxiety disorders and depression is mainly provided under the Improving Access to Psychological Therapies programme (IAPT, 2011a). Several validated self-report psychological questionnaires are used routinely in the assessment of patients in the IAPT. These include the Patient Health Questionnaire (PHQ-9; Kroenke et al, 2001), the Generalized Anxiety Disorder questionnaire (GAD-7; Spitzer et al, 2006), the Short Health Anxiety Inventory (SHAI; Salkovskis et al, 2002), the Panic Disorder Severity Scale – Self Report form (PDSS-SR; Houck et al, 2002), the Social Phobia Inventory (SPIN) (Connor et al, 2000), the Obsessive–Compulsive Inventory (OCI; Foa et al, 1998), and the Penn State Worry Questionnaire (PSWQ; Meyer et al, 1990).

Some of the above-mentioned questionnaires, or shorter versions of them, can be used in tinnitus and hyperacusis clinics to screen for co-morbid psychological disorders. However, it is not clear whether these questionnaires are relevant to the problems faced by patients experiencing tinnitus and hyperacusis and whether patients seen in NHS audiology clinics find completing such questionnaires relevant to them and applicable generally to people with tinnitus and/or hyperacusis.

The aims of this study were to assess for each psychological questionnaire: (1) the proportion of patients seeking treatment for tinnitus and hyperacusis under the UK NHS who give abnormal scores; (2) whether high scores for tinnitus handicap are associated with an increased likelihood of an abnormal score; (3) whether high scores for hyperacusis handicap are associated with an increased likelihood of an abnormal score; (4) patients' views as to personal relevance and general applicability of the questionnaire. The results were intended to inform audiologists in selecting the appropriate questionnaires to be used in screening for psychological co-morbidities and in deciding whether to make onward referrals.

Methods

Study design

This was a questionnaire-based service evaluation survey designed to improve the assessment and onward referral procedures in routine NHS care at the Tinnitus and Hyperacusis Therapy Specialist Clinic (THTSC), Royal Surrey County Hospital, Guildford, UK. All patients who attended the THTSC for therapy sessions from 15th March 2015 to 15th March 2016 were asked in person by their audiologist to complete the psychological questionnaires and provide their feedback. They were informed that their participation was completely voluntary and some patients did not complete all of the questionnaires. Demographic data for the patients and the outcomes of their latest audiological investigations and their routine self-report questionnaires were imported from records held at the Audiology department. These comprised: (1) pure tone audiogram measured using the procedure described by the British Society of Audiology (BSA, 2004); (2) uncomfortable loudness levels (ULLs) measured following the BSA recommended procedure (BSA, 2011); (3) a wide range of self-report questionnaires comprising the Tinnitus Handicap Inventory (THI; Newman et al, 1996), the Hyperacusis Questionnaire (HQ; Khalifa et al, 2002), the Insomnia Severity index (ISI; Bastien et al, 2001), the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), and the Visual Analogue Scale (VAS; Maxwell, 1978) of tinnitus loudness, annoyance and effect on life; (4) Age.

Ethical approval

This study was initially registered as a service evaluation with the Clinical Audit, Patient Safety and Quality department at the Royal Surrey County Hospital. Further analysis of the data was approved by the South West-Cornwall and Plymouth Research Ethics Committee and the Research and Development department at the Royal Surrey County Hospital.

Study population

The total number of patients who attended the THTSC in the one-year period was 402. According to local service agreements, all patients who need tinnitus or hyperacusis therapy should be referred via their GPs. However, most of the patients attending the THTSC had seen an ENT specialist who recommended tinnitus and hyperacusis rehabilitation. The average age of the patients was 57 years (standard deviation, SD = 15 years, range 16 to 95 years). The mean pure-tone average (PTA) audiometric threshold at the frequencies 0.25, 0.5, 1, 2, and 4 kHz was 25 dB HL (SD =19 dB) for the right ears and 25 dB HL (SD =18 dB) for

the left ears. The mean uncomfortable loudness level (ULL) at the frequencies 0.25, 0.5, 1, 2, 4 and 8 kHz was 83 dB HL (SD =14 dB) for the right ears and 83 dB HL (SD =15 dB) for the left ears. The mean scores on the THI, VAS, HADS, ISI, and HQ are shown in Table 1.

Table 1

Routine questionnaires

The questionnaires listed in this section are those that are routinely given to all patients attending the THTSC for tinnitus or hyperacusis therapy.

THI

The THI has 25 items, and response choices are "no" (0 points), "sometimes" (2 points) and "yes" (4 points). The overall score ranges from 0 to 100. Scores from 0–16 indicate no handicap, scores from 18–36 indicate mild handicap, scores from 38–56 indicate moderate handicap, and scores from 58–100 indicate severe handicap (Newman et al, 1996).

HQ

The HQ comprises 14 items and the response choices are "no" (0 points), "yes, a little" (1 points), "yes, quite a lot" (2 points), and "yes, a lot" (3 points). The overall score ranges from 0 to 42. Scores above 26 indicate strong auditory hypersensitivity (Meeus et al, 2010).

ISI

The ISI comprises seven items that assess the severity of sleep difficulties and their effect on the patient's life. Each item is rated on a scale from 0 to 4 and the total score ranges from 0 to 28. Scores from 0-7 indicate no clinically significant insomnia, scores from 8-14 indicate minimal insomnia, scores from 15-21 indicate moderate insomnia, and scores from 22-28 indicate severe insomnia (Bastien et al, 2001).

HADS

The HADS consists of 14 items each rated from 0 to 3 according to the severity of difficulty experienced. Eight items require reversed scoring, after which depression (HADS-D) and anxiety (HADS-A) subscale totals are calculated. Total scores for each subscale range from 0 to 21. Scores from 0-7 are classified as normal, scores from 8-10 are classified as borderline abnormal, and scores from 11-21 are classified as abnormal (Zigmond & Snaith, 1983).

194

195 VAS

196 VAS scores are ratings on a scale from 0 to 10. The VAS score for loudness of tinnitus was
197 assessed by asking the patient to rate the loudness of tinnitus during their waking hours over
198 the last month (It was explained that 0 corresponds to no tinnitus being heard and 10 is the
199 loudest sound that they can imagine). The VAS score for annoyance induced by the tinnitus
200 was assessed by asking the patient to rate their subjective perception of annoyance on average
201 during the last month (It was explained that 0 corresponds to no annoyance and 10 is the most
202 annoying thing that can possibly happen). The VAS score for the impact of tinnitus on their
203 life was assessed by asking the patient to rate the effect of tinnitus on their life during the last
204 month (It was explained that 0 corresponds to no effect and 10 is an extreme effect).

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206 *Additional questionnaires examining psychological factors*

207 The questionnaires listed in this section are not used in the routine assessment of patients
208 attending the THTSC for tinnitus or hyperacusis therapy, but were used here to assess
209 psychological factors that might be associated with tinnitus or hyperacusis.

210

211 GAD-7

212 This is a 7-item questionnaire for assessment of anxiety symptoms (Spitzer et al, 2006).
213 Patients are asked how often during the last 2 weeks they had been bothered by each
214 symptom. Response options are not at all (0), several days (1), more than half the days (2),
215 and nearly every day (3). The total score ranges from 0 to 21. Cronbach's alpha for the GAD-
216 7 is 0.92 and its test-retest reliability (intraclass correlation) is $r = 0.83$ (Spitzer et al, 2006). A
217 score of 10 or above is suggested as indicating anxiety disorder (Spitzer et al, 2006).
218 However, the recommended cut-off score for general anxiety in the UK mental health system
219 is a score of 8 or above (IAPT, 2011b). This is referred to as meeting "caseness".

220

221 SHAI

222 Health anxiety is excessive fear of having a serious illness based on the misinterpretation of
223 bodily sensations (American Psychiatric Association, 2000). The SHAI has 18 items. Each
224 item consists of four statements in which the individual is instructed to select the statement
225 that best describes their feelings over the past two weeks. Item scores are weighted 0–3 and
226 are summed to obtain a total score between 0 and 54. Cronbach's alpha for this questionnaire

is between 0.74 and 0.96 (Alberts et al, 2013). Test-retest reliability was found to be good ($r = 0.87$) (Olatunji et al, 2011). A score of 27 or above indicates the likely presence of health anxiety (Alberts et al, 2013). However, a less conservative score of 18 or above was suggested by Rode et al (2006). The score that is used in mental health services in the UK to indicate caseness is 18 or above (IAPT, 2011b).

MINI-SPIN

The Mini-SPIN (Connor et al, 2001) is the short version of the SPIN (Connor et al, 2000) questionnaire, which is designed to assess social anxiety disorder. Cronbach's alpha for the SPIN is 0.94 and its test-retest reliability is $r = 0.89$ (Connor et al, 2000). Unlike the 17-item full version used in the IAPT, the Mini-SPIN consists of only 3 items. Each item has 5 possible answers with scores from 0 to 4. The total score is between 0 and 12. Total scores of 6 or higher on the Mini-SPIN indicate possible problems with social anxiety (Weeks et al, 2007). The recommended cut-off for caseness for social phobia in the UK mental health system is a score of 19 or above on the full version of the SPIN (IAPT, 2011b). Scores of 6 or higher on the Mini-SPIN indicate possible problems with social anxiety (Connor et al, 2001).

OCI-R

The OCI-R (Foa et al, 2002) is the short version of the OCI (Foa et al, 1998) and is a self-report questionnaire to assess symptoms of obsessive compulsive disorder (OCD). While the full version used in the IAPT contains 42 items, the OCI-R contains only 18 items. Items are rated on 5-point Likert-type scale (0-4) giving total scores between 0 and 72. Patients are instructed to circle the number that best describes how much that experience has distressed or bothered them during the past month. This questionnaire has 6 subscales: Checking, Washing, Obsessing, Mental Neutralizing, Ordering, and Hoarding (Foa et al, 2002). Cronbach's alpha for the total score is 0.81 and test-retest reliability is 0.82, both of which are good (Foa et al, 2002). The recommended cut-off for caseness for OCD in the UK mental health system is scores of 40 or above on the full version of the OCI (IAPT, 2011b). Scores of 21 or above indicate the likely presence of OCD for the OCI-R (Foa et al, 2002).

PDSS-SR

This is a 7-item questionnaire for assessment of panic disorder. Each item has 5 possible answers weighted from 0 to 4 (0= none, higher ratings reflecting more severe symptoms). Patients are instructed to choose the answer that best reflects how they have felt over the past

week. For this questionnaire, a panic attack is defined as a sudden rush of fear or discomfort accompanied by at least four of the following panic symptoms: rapid or pounding heartbeat, chest pain or discomfort, chills or hot flushes, sweating, nausea, fear of losing control or going crazy, trembling or shaking, dizziness or faintness, breathlessness, feelings of unreality, fear of dying, feeling of choking, numbness or tingling. The total score is between 0 and 28. Cronbach's alpha for this questionnaire is 0.92 and it has good test-retest reliability ($r = 0.81$) (Houck et al, 2002). Yamamoto et al (2004) suggested that total scores up to 10 correspond to mild, 11-15 to moderate, and 16 or above to severe panic disorder. Furukawa et al (2009) suggested a cut off score of 8 to identify people with panic disorder. The recommended cut-off for caseness in the UK mental health system is a score of 8 or above (IAPT, 2011b).

PHQ-9

This is a 9-item questionnaire for assessment of depression. The total score ranges from 0 to 27. A score less than 5 indicates no depression, while 5-9 indicates mild depression, 10-14 indicates moderate depression, 15-19 indicates moderately severe depression, and a score over 19 indicates severe depression (Kroenke et al, 2001). Cronbach's alpha for the PHQ-9 is 0.89 and its test-retest reliability is $r = 0.84$ (Kroenke et al, 2001). The recommended cut-off for caseness for depression in the UK mental health system is a score of 10 or above (IAPT, 2011b).

PSWQ-A

The PSWQ-A (Hopko et al, 2003) is a short version of the PSWQ used for assessment of generalised anxiety disorder. The full version used in the IAPT has 16 items while the PSWQ-A contains only 8 items. Each item has 5 possible answers with scores from 1 (not at all typical of me) to 5 (very typical of me). The total score for the PSWQ-A is between 8 and 40. Cronbach's alpha was 0.89 and test-retest reliability was $r = 0.87$ (Crittendon & Hopko, 2006). The recommended cut-off for caseness for generalised anxiety disorder in the UK mental health system is a score of 45 or above on the full version of the PSWQ (IAPT, 2011b). A score of 23 or more on the PSWQ-A indicates the presence of generalised anxiety disorder (Wuthrich et al, 2014).

Additional questionnaire assessing patients' views of the psychological questionnaires

After completing each questionnaire assessing psychological factors, patients were asked to complete a form, the patient feedback questionnaire (PFQ), assessing their views of the psychological questionnaire. The PFQ included two items:

1- Was this questionnaire relevant to you?

Patients were asked to rate the relevance of the questionnaire on a scale from 1 to 5 (1 = not at all, 5 = very relevant).

2- Would you recommend the use of this questionnaire for assessment of patients with tinnitus and/or hyperacusis?

Patients were asked to rate whether they would recommend the questionnaire on a scale from 1 to 5 (1 = not at all, 5 = definitely).

Order of administration of the questionnaires

The questionnaires were administered in the following order: GAD-7, PFQ, SHAI, PFQ, MINI-SPIN, PFQ, OCI-R, PFQ, PDSS-SR, PFQ, PHQ-9, PFQ, PSWQ-A, PFQ

Data analysis

The data were anonymised prior to statistical analysis. Descriptive statistics (means, SDs, and 95% confidence intervals, CI) for the characteristics of the patients and scores for the self-report questionnaires and the feedback form for each questionnaire, were calculated. Group differences between responders and non-responders were assessed using t-tests. The p value required for statistical significance was set at $p < 0.05$. Multinomial logistic regression was used to assess whether higher scores on the THI and HQ were associated with abnormal scores on the psychological questionnaires. These analyses yielded a relative risk ratio (RRR) of an abnormal score on each questionnaire based on scores for the THI and HQ. Some of those who responded did not complete all of the questionnaires. The analyses were restricted to responders with complete data on all variables required for a particular analysis. The number of patients included in each analysis (n) is reported. The STATA programme (version 13) was used for statistical analyses.

Results

Characteristics of the responders

A total of 150/402 of patients completed the additional questionnaires assessing psychological factors, a response rate of 37%. All of these patients were referred via their

GPs. However, 85% of the responders had also been seen by an ENT specialist who made a recommendation to their GP for a referral to the THTSC for tinnitus or hyperacusis rehabilitation.

As shown in Table 2, there were no significant differences between the responders and non-responders in age, PTA of the better and worse ear, ULLs of the worse ear (the ear with smaller ULL values between 0.25 and 8 kHz), and, with one exception, scores for the questionnaires. The exception was that the mean VAS for tinnitus loudness was slightly higher (worse) for responders than for non-responders ($p=0.04$).

Table 2 here

Based on the PTA of the worse ear ($n=139$ for the responders with available audiograms), 1.5% had profound hearing loss, 3.6% had severe hearing loss, 17% had moderate hearing loss, and 40% had mild hearing loss; the remainder had no hearing loss. Based on scores for the THI, 11% (16/144) had no tinnitus handicap, 22% (32/144) had a mild tinnitus handicap, 29% (42/144) had a moderate tinnitus handicap and 55% (54/144) had a severe tinnitus handicap. The average ULL (averaged across 0.25, 0.5, 1, 2, 4, and 8 kHz) was 84 dB HL (SD =14 dB) for both the right and left ears. Based on the average ULLs in the worse ear (the ear with lower sound tolerance thresholds), 31% (29/95) of patients were considered as having abnormally low ULLs (below 80 dB HL), which might be an indication of hyperacusis. Based on scores for the HQ, 26% (37/145) of the responders experienced significant hyperacusis handicap. Twenty two percent (14/65) of the responders had both abnormally reduced ULLs and significant hyperacusis handicap.

Based on scores for the ISI, 27% (38/142) of the responders did not have insomnia, 30% (42/142) had sub-threshold insomnia, 30% (42/142) had moderate insomnia, and 14% (20/142) had severe insomnia. Based on scores for the anxiety subscale of the HADS, 38% (56/147) of the responders had normal scores, 21% (31/147) had borderline abnormal scores, and 41% (60/147) had abnormal scores. Based on scores for the depression subscale of the HADS, 64% (94/146) of the responders had normal scores, 20% (29/146) had borderline abnormal scores, and 16% (23/146) had abnormal scores.

Responses on the PFQ

Table 3 shows the responses on the PFQ regarding whether the patients found the psychological questionnaires to be relevant to their problems and whether they would

recommend their use in the assessment of patients with tinnitus and/or hyperacusis. With the exception of the PDSS-SR, which only 45% of respondents thought was relevant for them (giving scores of 3, 4 or 5), all questionnaires were thought to be personally relevant by 60% or more of respondents. Similarly, with the exception of the PDSS-SR, which only 61% of respondents recommended for use in the evaluation of patients with tinnitus and/or hyperacusis, all questionnaires were recommended by 69% or more of respondents. The highest ratings for both personal relevance and recommended use were given to the GAD-7, PHQ-9, and PSWQ-A questionnaires, for which over 79% of the patients recommended their use.

Table 3 here

Prevalence of psychological disorders and relationship to severity of tinnitus and hyperacusis handicap

Table 4 shows the means and SDs of the total scores on the questionnaires concerned with psychological problems. Sixty five percent of the patients met the caseness criteria for at least one psychological test. Over 10% of patients with mild tinnitus handicap had abnormal scores for the GAD-7, SHAI, Mini-SPIN, OCI-R, PDSS-SR, and PSWQ-A (Table 5). Over 20% of patients with moderate tinnitus handicap and over 30% of patient with hyperacusis handicap (score ≥ 26 on HQ) had abnormal scores for the GAD-7, SHAI, Mini-SPIN, OCI-R, PDSS-SR, PSWQ-A, and PHQ-9 (Table 5).

The outcomes of the multinomial logistic regression model are shown in Table 5. The RRR values in relation to tinnitus handicap are expressed relative to the values for patients with no tinnitus handicap except for two questionnaires that were not completed by any patients with no tinnitus handicap, namely the PDSS-SR and the PHQ-9. For these two questionnaires, RRR values in relation to tinnitus handicap are expressed relative to the values for patients with mild tinnitus handicap. There were significant relationships between tinnitus handicap category and responses on the GAD-7, SHAI and PHQ-9, which assess generalised anxiety, health anxiety and depression. The RRR of abnormal scores on the GAD-7 increased by factors of 12.7 (95% CI: 1.5-107) and 18 (95% CI: 2.2- 151) for patients with moderate and severe tinnitus handicap, respectively, relative to those with no tinnitus handicap. The RRR of abnormal scores on the PHQ-9 increased by a factor of 4.3 (95% CI: 1.1-16.9) for patients with severe tinnitus handicap relative to those with mild handicap. The

RRR of abnormal scores on the SHAI increased by a factor of 9.05 (95% CI: 1.05-78) for patients with severe tinnitus handicap relative to those with no tinnitus handicap.

There were significant relationships between hyperacusis handicap and responses on the PHQ-9, SHAI, Mini-SPIN, PDSS-SR, and PSWQ. The RRR of abnormal scores on the PHQ-9, SHAI, Mini-SPIN, PDSS-SR and PSWQ increased by factors of 2.7 (95% CI: 1.04-7.13), 4.05 (95% CI: 1.59-10.3), 3.4 (95% CI: 1.4-8.09), 4.4 (95% CI: 1.5-12.8), and 2.5 (95% CI: 1.2-7.3), respectively, for patients with HQ scores above 26 relative to scores for those with scores below 26. Scores on the OCI-R were not related to tinnitus or hyperacusis handicap.

Discussion

Study limitations

In this study we assessed the viewpoint of patients who were referred for tinnitus or hyperacusis rehabilitation to an Audiology outpatient clinic in the UK regarding a wide range of psychological self-report questionnaires. Specifically, the patients were asked to rate the relevance of each questionnaire to themselves and to rate how strongly they would recommend the general use of each questionnaire in the evaluation of patients with tinnitus and/or hyperacusis. Although the self-report questionnaires under examination were validated instruments, the PFQ that was used in order to assess them was specifically designed for local service evaluation at the RSCH and no data with regard to its psychometric properties are available (e.g., test-retest reliability). Therefore, the results obtained using the PFQ need to be interpreted with caution.

The response rate was 37%, which is not as high as the average response rate of 55% for surveys conducted by primary health care services in the NHS (Grol et al, 1999). This indicates a risk of selection bias (Pannucci & Wilkins, 2010). The outcomes of this study may not be representative of the whole sample of tinnitus and hyperacusis patients seen at the THTSC. Nevertheless, there was no significant difference between responders and non-responders in any of the measures obtained during their standard evaluation for tinnitus and hyperacusis, except for a difference in the VAS scores for tinnitus loudness (6.5 for responders and 6.0 for non-responders). Therefore, it seems unlikely that selection bias had a strong influence on the outcomes.

In this study, 85% of the responders had been seen by an ENT specialist and 100% had been seen by their GP prior to being referred to the THTSC. Our results may not be representative of patients who self-refer for treatment for tinnitus and hyperacusis. Although,

most people who are bothered by tinnitus seek medical help, once they are informed that there is no definitive cure, they often choose to self-manage their symptoms and do not seek further professional help. One study showed that only 42% of the patients who were seen by an ENT department wished to undertake further tinnitus counselling (Aazh et al, 2009). It is plausible that patients who choose to receive professional help for tinnitus or hyperacusis experience greater distress than those who choose to self-manage. Therefore, the tinnitus-related and/or hyperacusis-related distress in our sample may be more severe than for a typical sample of tinnitus/hyperacusis patients who seek help for the first time. Nevertheless our data are relevant to Audiology services offering rehabilitative interventions for patients with troublesome tinnitus or hyperacusis who seek professional help in the management of their tinnitus or hyperacusis. Such patients form the typical case load of audiologists who specialise in tinnitus and hyperacusis rehabilitation.

As the questionnaires were administered in a fixed order, it is possible that patients felt tired when completing the later questionnaires, which could have led to a response bias. However, a meta-analysis showed that the association between the length of questionnaires and response pattern is weak, and the quality and relevance of the content of the questionnaires from the patient's point of view is the main factor influencing completion rate and data quality (Rolstad et al, 2011). In the present study, the questionnaires were well researched standardised questionnaires that are widely used in mental health services in the UK, and the majority of the responders found them to be relevant. Hence, it is unlikely that there was any substantial response bias due to fatigue.

Acceptability of the questionnaires

The questionnaires that were assessed in this study were the GAD-7, SHAI, Mini-SPIN, OCI-R, PDSS-SR, PHQ-9, and PSWQ-A. All except the PDSS-SR were rated as personally relevant (scores of 3, 4, or 5 on the PFQ) by 61% or more of patients. It seems that symptoms of panic (as assessed by the PDSS-SR) are not regarded as personally relevant by most patients seeking help for tinnitus and/or hyperacusis, but anxiety (as assessed by the GAD-7 and PSWQ-A) is especially relevant. Our results also showed that abnormal scores on PDSS-SR in our sample were less prevalent than for other questionnaires. This is consistent with general population surveys that suggest that panic disorder is less prevalent than other anxiety disorders and depression (Bandelow & Michaelis, 2015). A similar pattern emerged for patients' recommendations for general use, with the GAD-7 and PSWQ-A receiving the highest overall ratings. However, for general use even the PDSS-SR was recommended by

61% of patients and the PHQ-9 was recommended by 79% of patients, indicating that panic disorder and depression are also regarded as relevant by most patients seeking help for tinnitus and/or hyperacusis.

Clinical applicability of the psychological questionnaires

Sixty five percent of patients met the caseness criteria for at least one of the psychological questionnaires. This highlights the need for screening for psychological disorders among patients seen for tinnitus and hyperacusis rehabilitation at audiology departments and for onward referral for further assessment and management of the co-morbid psychological disorder(s) by mental health services. The highest incidence of caseness (44%) occurred for the GAD-7, which assesses anxiety. Caseness was above 29% for two other questionnaires that assess anxiety, namely the SHAI (which assesses health anxiety) and the PSWQ-A (which assesses generalised anxiety). These incidence values are somewhat higher than the incidence values for anxiety of 10% (Bartels et al, 2008) and 23% (Adoga et al, 2008) reported for patients whose primary complaint is tinnitus, but are comparable to the incidence of 47% reported for patients whose primary complaint is hyperacusis (Juris et al, 2013). Note that 26% of the patients in our sample suffered from both tinnitus and hyperacusis. The high incidence of caseness for the GAD-7 is consistent with the finding that the GAD-7 was rated highly both for personal relevance (79% of patients giving ratings of 3, 4, or 5) and for general use (85% of patients giving ratings of 3, 4, or 5).

The incidence of caseness was 26% for the PHQ-9, which assesses depression. This value is within the incidence range for depression of 10% (Bartels et al, 2008) to 69% (Andersson et al, 2004) reported for patients whose primary complaint was tinnitus, and slightly above the incidence of depression of 17% reported for patients whose primary complaint was hyperacusis (Paulin et al, 2016). Seventy percent of our patients thought that the PHQ-9 was relevant to them, and 79% recommended it for general use in assessing patients with tinnitus and/or hyperacusis.

The incidence of caseness was 23% for the OCI-R, which assesses OCD. This contrasts with the finding of Andersson et al (2004) that 83% of tinnitus sufferers had OCD. However, theirs was an internet-based survey using a relatively small (n = 44) sample of self-selected tinnitus sufferers and their criteria for diagnosis of psychiatric disorders were relatively lax, being described as “probable case”. In fact, the incidences of many psychiatric disorders found in their study were much higher than have been found in other studies of

tinnitus sufferers. The authors themselves concluded that “diagnostic criteria need to be adjusted for Internet use”.

Our data show that over 20% of patients with moderate tinnitus handicap (THI scores $\geq 36/100$) and over 30% of patient with hyperacusis (HQ scores ≥ 26) had abnormal scores for the GAD-7, SHAI, Mini-SPIN, OCI-R, PDSS-SR, PSWQ-A, and PHQ-9. Therefore, application of these questionnaires may be useful in the assessment of such patients, as they might need a referral to mental health services. However, due to the time constraints in audiology clinics, audiologists may have to limit the number of questionnaires uses. The outcome of our risk ratio analysis maybe used to select appropriate questionnaires based on the patient’s initial THI or HQ scores. Patients with THI scores ≥ 36 are at higher risk of abnormal scores on the GAD-7, SHAI, or PHQ-9. Hence, application of these questionnaires is recommended for such patients. Patients with HQ scores ≥ 26 are at higher risk of abnormal scores on the SHAI, Mini-SPIN, PDSS-SR, PHQ-9, and PSWQ-A. The value of the PDSS-SR remains in some doubt.

It should be emphasised that application of these questionnaires is not a replacement for psychological/psychiatric evaluation; instead these questionnaires could be used to identify tinnitus and hyperacusis patients who need to be referred for psychological/psychiatric evaluations and possible treatment. Many patients who give abnormal scores on these questionnaires will, on further evaluation, not be considered as having a mental health problem that needs treating, but some will go on to receive treatment.

More research is needed to determine the proportion of patients referred from tinnitus/hyperacusis clinics for psychological/psychiatric evaluation who go on to receive treatment for mental health problems. Some patients may be reluctant to see a psychologist or psychiatrist, believing that their problems are to do with the auditory system rather than being psychological in nature. However, the likelihood of such patient reluctance appears to be low, as 70% or more of the patients in our sample thought that the GAD-7, PSWQ-A, SHAI, and PHQ-9 were relevant to them personally, and 70% or more thought that these questionnaires were appropriate for general use in evaluating patients seeking help for tinnitus and/or hyperacusis.

Conclusions

Sixty five percent of patients met the caseness criteria for at least one of the psychological questionnaires. At least 20% of patients with THI scores ≥ 36 and 30% of patients with HQ

scores ≥ 26 had abnormal scores for the GAD-7, SHAI, Mini-SPIN, OCI-R, PDSS-SR, PSWQ-A, and PHQ-9. Based on responses to the PFQ, all questionnaires except the PDSS-SR were relevant to the patients and were recommended by them for assessment of patients with tinnitus and/or hyperacusis. The psychological questionnaires, excluding the PDSS-R, may be considered for use as a part of the assessment package for patients with tinnitus and hyperacusis.

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